

Serial No. 09/692,668
December 8, 2003
Reply to the Office Action dated July 8, 2003
Page 2 of 11

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claim 1 (previously presented): A surface acoustic wave device comprising:
a longitudinally coupled resonator filter including:

a piezoelectric substrate having a pair of substrate edges and an upper surface therebetween and including a main region and a bottom surface, the piezoelectric substrate having at least one step formed therein and extending from one of said pair of substrate edges to an inner edge of the at least one step located spaced from the one of the pair of substrate edges, the inner edge of said at least one step being arranged to contact the main region and to extend from the upper surface toward the bottom surface of the piezoelectric substrate inside the one of the pair of substrate edges;

at least two interdigital transducers provided on the main region of the piezoelectric substrate such that shear horizontal type surface acoustic waves excited by the interdigital transducer and having a wavelength of λ are reflected by the at least one inner edge;

wherein a distance L between the inner edge of the at least one step and the corresponding one of the substrate edges is in the range of about $\lambda/10$ to about 8λ , and a depth of the at least one step is in the range of about 2λ to about 6λ .

Claims 2 and 3 (canceled).

Serial No. 09/692,668
December 8, 2003
Reply to the Office Action dated July 8, 2003
Page 3 of 11

Claim 4 (original): A surface acoustic wave device according to claim 1, wherein the piezoelectric substrate is made of at least one of piezoelectric ceramics and piezoelectric single crystals.

Claim 5 (previously presented): A surface acoustic wave device according to claim 1, wherein said at least one step comprises a pair of steps arranged such that said inner edges of said pair of steps are substantially parallel to the substrate edges and extending from the upper surface toward the bottom surface of the piezoelectric substrate.

Claim 6 (canceled).

Claim 7 (original): A surface acoustic wave device according to claim 1, wherein the inside surfaces define reflection edges for reflecting the shear horizontal type surface acoustic wave.

Claim 8 (canceled).

Claim 9 (previously presented): A surface acoustic wave device according to claim 1, wherein the at least two interdigital transducers include a plurality of electrode fingers, and if the wavelength of the surface acoustic wave is represented by λ , the widths of the outermost electrode fingers of the at least two IDTs are approximately $\lambda/8$ and the widths of all of the other electrode fingers are approximately $\lambda/4$.

Claim 10 (previously presented): A communication device comprising:
at least one surface acoustic wave device including:
a longitudinally coupled resonator filter comprising:

Serial No. 09/692,668

December 8, 2003

Reply to the Office Action dated July 8, 2003

Page 4 of 11

a piezoelectric substrate having a pair of substrate edges and an upper surface therebetween and including a main region and a bottom surface, the piezoelectric substrate having at least one step formed therein and extending from one of said pair of substrate edges to an inner edge of the at least one step located spaced from the one of the pair of substrate edges, the inner edge of said at least one step being arranged to contact the main region and to extend from the upper surface toward the bottom surface of the piezoelectric substrate inside the one of the pair of substrate edges;

at least two interdigital transducers provided on the main region of the piezoelectric substrate such that shear horizontal type surface acoustic waves excited by the interdigital transducer and having a wavelength of λ are reflected by the at least one inner edge;

wherein a distance L between the inner edge of the at least one step and the corresponding one of the substrate edges is in the range of about $\lambda/10$ to about 8λ , a depth of the at least one step is in the range of about 2λ to about 6λ .

Claims 11 and 12 (canceled).

Claim 13 (original): A communication device according to claim 10, wherein the piezoelectric substrate is made of at least one of piezoelectric ceramics and piezoelectric single crystals.

Claim 14 (previously presented): A communication device according to claim 10, wherein said at least one step comprises a pair of steps arranged substantially parallel to the substrate edges and extending from the upper surface toward the bottom surface of the piezoelectric substrate.

Serial No. 09/692,668
December 8, 2003
Reply to the Office Action dated July 8, 2003
Page 5 of 11

Claim 15 (canceled).

Claim 16 (previously presented): A communication device according to claim 14, wherein the inner edge defines a reflection edge for reflecting the shear horizontal type surface acoustic wave.

Claim 17 (canceled).

Claim 18 (previously presented): A communication device according to claim 14, wherein the at least two interdigital transducers include a plurality of electrode fingers, and if the wavelength of the surface acoustic wave is represented by λ , the widths of the outermost electrode fingers of the at least two IDTs are approximately $\lambda/8$ and the widths of all of the other electrode fingers are approximately $\lambda/4$.

Claim 19 (new): A surface acoustic wave device comprising:
an edge reflection type longitudinally coupled resonator filter including:

a piezoelectric substrate having a pair of substrate edges and an upper surface therebetween and including a main region and a bottom surface, the piezoelectric substrate having at least one step formed therein and extending from one of said pair of substrate edges to an inner edge of the at least one step located spaced from the one of the pair of substrate edges, the inner edge of said at least one step being arranged to contact the main region and to extend from the upper surface toward the bottom surface of the piezoelectric substrate inside the one of the pair of substrate edges;

at least two interdigital transducers provided on the main region of the piezoelectric substrate such that shear horizontal type surface acoustic waves

Serial No. 09/692,668

December 8, 2003

Reply to the Office Action dated July 8, 2003

Page 6 of 11

excited by the interdigital transducer and having a wavelength of λ are reflected by the at least one inner edge;

wherein a distance L between the inner edge of the at least one step and the corresponding one of the substrate edges is in the range of about $\lambda/10$ to about 8λ , and a depth of the at least one step is in the range of about 2λ to about 6λ .